

Measurements—Continued.

Current number of specimen.....	}	(716)
Locality.....		23945.
		Lat. 49° N.,
		Long. 151 W.,
		Sept. 15, 1871.
		Milli-
		meters.
		100ths
		of
		length.
Head:		
Greatest length.....		27½
Greatest width.....		10
Width of interorbital area.....		7
Length of snout.....		3½
Length of maxillary.....		18
Length of mandible.....		18½
Diameter of orbit.....		9
Dorsal (first):		
Distance from snout.....		52
Length of base.....		17
Length of longest ray.....		15
Dorsal (soft):		
Distance from snout.....		78
Length of longest ray.....		7½
Anal:		
Distance from snout.....		56
Length of base.....		23
Length of longest ray.....		15
Pectoral:		
Distance from snout.....		26
Length.....		14
Ventral:		
Distance from snout.....		37
Length.....		12
Dorsal.....	I, 11	
Anal.....	I, 16	
Pectoral.....	13	
Ventral.....	7	
Number of scales in lateral line.....	45	
Number of transverse rows above lateral line.....	2½	
Number of transverse rows below lateral line.....	6½	

NOTES ON THE FISHES OF THE PACIFIC COAST OF THE UNITED STATES.

By DAVID S. JORDAN and CHARLES H. GILBERT.

It is the purpose of this paper to present a list of the species of fishes known to occur along our Pacific coast, between the Mexican boundary and the boundary of British Columbia, together with notes on the distribution, habits, size, value, etc., of each species, in advance of the publication of a general descriptive work. The paper is to be considered mainly in the light of a contribution to our knowledge of the geographical distribution of fishes. The "common names" here given are, in all cases, those heard by the writers among the fishermen on different parts of the coast.

Family BRANCHIOSTOMATIDÆ.

1. *Branchiostoma lanceolatum* (Pallas) Gray.

Obtained by Dr. J. G. Cooper in San Diego Bay. Not seen by us.

Family MYXINIDÆ.

2. *Polistotrema dombeyi* (Müller) Gill.—*Lamperina*; *Hag*; *Eel*.

Santa Barbara (*vide* J. Weinmiller) to Eel River (Lockington). Very abundant in the Bay of Monterey, but not taken elsewhere by us. It

fastens itself usually on the gills or isthmus of large fishes, sometimes on the eyes, whence it works its way very rapidly into the inside of the body. It then devours all the flesh of the body without breaking the skin, so that the fish is left a mere hulk of head, skin, and bones. It is especially destructive to fishes taken in gill-nets. In every gill-net set at Monterey in summer, more or less of these empty shells are obtained. When these are taken from the water the hag-fish scrambles out with great alacrity. It is thought by the fishermen that the hags enter the fish after the latter are caught in the gill-net, and that they will devour a fish of 10 or 15 pounds weight in a single night. At any rate, large fishes of even 30 pounds are often brought up without flesh and without viscera, and we can hardly suppose that they swim about in the sea in this condition before coming into the gill-nets. The fish chiefly eaten are *Sebastichthys pinniger*, *miniatus*, *mystinus*, etc., *Ophiodon elongatus*, *Paralichthys maculosus*, and *Rhacochilus toxotes*.

The hag-fish reaches a length of 14 inches, and is not used as food.

The genus *Polistotrema* (Gill, MSS.) is distinguished from *Heptatrema* (*Bdellostoma*) by the presence of 11 or 12 gill-openings instead of 7.

Family PETROMYZONTIDÆ.

3. *Ammocœtes plumbeus* (Ayres) J. & G.

San Francisco northward; seen by us at Seattle and San Francisco. Nothing especial known of its habits, but it doubtless ascends most of the coast streams in spring. It reaches a length of 8 inches, and is not brought into market except when accidentally mixed with other species.

4. *Entosphenus tridentatus* (Richardson) Gill.—*Lamprey*; *Lamperina*.

(*Petromyzon lirus*, *ciliatus*, *tridentatus*, and *astori* Girard.)

Monterey Bay to Puget Sound; seen by us at Santa Cruz and Astoria. It ascends the fresh waters in the spring to spawn, running in the Columbia in June. It reaches a length of more than 2 feet, and becomes very fat. It is never used as food so far as we know.

Family NOTIDANIDÆ.

5. *Notorhynchus maculatus* Ayres.

From Monterey to Puget Sound. In Humboldt Bay it is extremely abundant, and it is much sought for the oil.

6. *Hexanchus corinus* Jordan & Gilbert.—*Shovel-nosed Shark*.

Monterey to Puget Sound; probably not uncommon. A fine example obtained at Neah Bay (Cape Flattery) by James G. Swan. Another taken by us at Soquel.

Family HETERODONTIDÆ.

7. *Heterodontus francisci* (Girard) Duméril.—*Leopard Shark*; *Bull-head Shark*.

From Point Concepcion southward. Described by Girard from Monterey, but not seen by us there, and probably very rarely or never reach-

ing San Francisco. Abundant at San Pedro and San Diego and not rare at Santa Barbara. It lays its eggs in January. They are enveloped in large cylindrical egg-cases, which are spirally twisted and without tentacles. This shark reaches a length of $2\frac{1}{2}$ feet, and is used for no purpose.

Family SCYLLIIDÆ.

8. *Catulus ventriosus* (Garman) J. & G.—*Ground Shark; Puffer Shark.*

From Monterey Bay southward. Abundant at Santa Barbara in winter, where it lives in the kelp, and is taken in large numbers in lobster-pots set for the "crawfish" (*Panulirus interruptus*), it being very fond of the salt fish used as bait. It is rarely taken in the summer, and it perhaps visits shallow water in the spawning season only, retiring to deeper water in summer. The egg-cases are extruded in February. They are flattish, oblong, quadrangular, with very long tentacles at the angles. This shark reaches a length of $2\frac{1}{2}$ feet, and is valueless. It is remarkable for its habit of inflating its body by swallowing air, like a *Tetrodon*.

Family GALEORHINIDÆ.

9. *Mustelus hinnulus* (Blainville) J. & G.—*Dog Shark.*

(*Mustelus californicus* Gill.)

From San Francisco southward. Very abundant at San Pedro and San Diego, living chiefly in bays and lagoons and feeding upon crustacea and small fish. It has very little oil in its liver, and is used only for crawfish bait and similar purposes. The young are sometimes salted and dried by the Chinese, tied in bundles, and shipped inland to the Chinese laborers on the railroads. They are not much valued even by them.

Most of the specimens seen were 2 to $2\frac{1}{2}$ feet in length, but two adult females seen at San Pedro were 5 feet long and weighed about 40 pounds each.

10. *Rhinotriacis henlei* Gill.—*Dog Shark.*

Humboldt Bay to Monterey. Two adults $2\frac{1}{2}$ feet long, with the young inside and nearly ready for delivery, were taken at Monterey in April. The embryo is connected to the uterus by a placenta, as in *Rhinotriacis* (*Pleuraeromylon*) *levis*, with which the present species is doubtless congeneric. Many young examples about a foot long were obtained of the Chinese fishermen at Potrero, near San Francisco, in August, and numerous others were seen in Humboldt Bay. This species is chiefly used for bait.

11. *Triacis semifasciatus* Girard.—*Leopard Shark; Catfish; Cat Shark.*

From Cape Mendocino southward; very abundant in all bays and along sandy shores. The adults enter the lagoons in summer to bring forth their young, and hundreds of them are sometimes taken at once

with the seine. It reaches a length of about 3 feet and a weight of 25 pounds. It yields but very little oil, and is considered wholly worthless by all fishermen.

12. Galeorhinus galeus (Linnæus) Blainville.—*Oil Shark; White Shark.*

From Cape Mendocino southward; very abundant everywhere in bays and lagoons during the summer. It brings forth its young from May to August, entering shallow bays for this purpose. It is taken in large numbers for its fins and its oil at Soquel, Monterey, and especially at Westminster and Newport, in Los Angeles County. It is usually taken with hook and line, herring and other silvery fish being the best bait. It reaches a length of 5 or 6 feet and a weight of 50 pounds, although most of those taken range from 30 to 40. A single liver makes three-fourths to one gallon of oil. The pectoral, dorsal, and caudal fins are taken off and dried in the sun. The Chinese buy these at about 15 cents a pound when dried. They strip off the skin and remove the fleshy part, and the gelatinous rays of the fin are valued by them very highly for soup, selling when prepared at about \$1.50 per pound. The fins of no other American shark are considered valuable by the Chinese.

13. Galeocerdo tigrinus Müller & Henle.—*Man-eater Shark.*

From San Diego southward. The jaws of a large example taken near San Diego were seen.

14. Carcharhinus glaucus (Linnæus) Jordan & Gilbert.—*Blue Shark.*

A young specimen taken near San Francisco is in the Museum of the California Academy of Sciences, and the jaws of an adult taken near Seattle are in the Museum of the University of Washington Territory.

15. Eulamia lamia (Risso) Gill.—*Bay Shark.*

A partially grown specimen and the jaws of an adult individual obtained at San Diego.

Family SPHYRNIDÆ.

16. Sphyrna zygzæna (Linnæus) Rafinesque.—*Hammer-head Shark.*

A specimen of this species was obtained by Dr. J. G. Cooper at San Pedro, and sent to the United States National Museum.

Family ALOPIIDÆ.

17. Alopias vulpes (Gmelin) Bonaparte.—*Thresher.*

Occasionally taken at San Francisco and in Monterey Bay. Probably most abundant at Soquel, but seen by us only at Monterey.

Family LAMNIDÆ.

18. Lamna cornubica (Linnæus) Müller & Henle.

A single specimen obtained at San Francisco. Another was taken last year at Santa Cruz, and a drawing of it made by Dr. C. L. Anderson.

19. *Isurus* (? *oxyrhynchus* Rafinesque).

Two jaws of a species of *Isurus*, supposed to be *I. oxyrhynchus*, were obtained at San Pedro.

20. *Carcharodon carcharias* (L.) J. & G.—*Man-eater Shark*.

Occasionally taken about Monterey Bay. One of 24 feet in length taken at Carmelo this year, and one of 20 feet at Soquel. One taken a few years ago at Soquel had a young sea-lion weighing 100 pounds in its stomach. It is valued only for the oil in its liver.

Family CETORHINIDÆ.

21. *Cetorhinus maximus* (Linnæus) Blainville.—*Ground Shark*.

Occasionally taken about Monterey by the whalers, and sometimes entangled in gill-nets. About five taken during the present year at Soquel and Monterey, ranging from 26 to 31 feet in length. It is valued for the oil in its enormous liver.

Family SCYMNIDÆ.

22. *Somniosus microcephalus* (Bloch) Gill.—*Ground Shark*.

From Puget Sound northward; not rare. Often taken on trawl-lines set for dog-fish. A specimen 8 feet in length seen by us at Victoria. The livers are used with those of the dog-fish for making "dog-fish oil". In habits this species is very sluggish, lying "on the water like a log".

Family SPINACIDÆ.

23. *Squalus acanthias* Linnæus.—*Dog-fish*; *Spinavola*.

From Santa Barbara to Alaska; occasional southward; excessively abundant from Puget Sound northward. It lives especially in deep or quiet bays or channels, coming into shallower water in pursuit of herring or salmon. It feeds chiefly on herring, but will take any bait, even its own young. It is caught in great numbers with trawl-lines for its oil, both by white men and Indians. It reaches a length of about 3 feet. The young are brought forth in June in Puget Sound.

Family SQUATINIDÆ.

24. *Squatina angelus* Duméril.—*Angel-fish*; *Angelo*; *Squat*.

From San Francisco southward; not uncommon. Seen by us at Soquel, Monterey, Santa Barbara, San Pedro, and San Diego. It reaches a length of nearly 5 feet and a weight of 60 pounds. It is not used for any purpose.

Family TORPEDINIDÆ.

25. *Torpedo californica* Ayres.

Not common. Seen by us only at Soquel and San Francisco. It reaches a length of at least 2½ feet and a weight of nearly 50 pounds.

Family RHINOBATIDÆ.

26. *Rhinobatus productus* Ayres.—*Guitar*; *Shovel-nosed Shark*.

From Cape Mendocino southward; exceedingly abundant from Santa Barbara to San Diego, inhabiting sandy shores. It brings forth its young in August. It reaches a length of 3 feet and a weight of 15 pounds. The tails of moderate-sized specimens are eaten by the Chinese and Mexicans, although little valued by either. The body is sometimes used for lobster bait.

27. *Platyrrhinoidis triseriatus* (Jordan & Gilbert) Garman.

From San Francisco southward; generally abundant, with the preceding. It is viviparous, bringing forth its young in August, 4 to 6 in each ovarial sac. It reaches a length of 20 inches and a weight of 4 to 5 pounds. It is used for no purpose.

28. *Syrrhina exasperata* (Jordan & Gilbert) Garman.

Seen by us at San Diego only, where half-grown specimens are very abundant. No adults have been seen by us, but it will probably be found to be a viviparous (and therefore Rhinobatoid) species. It is not used as food.

Family RAIDIDÆ.

29. *Raia stellulata* Jordan & Gilbert.

Seen by us only in the Bay of Monterey, where it is very abundant in the winter and spring. Both adults and young are taken in great numbers in the gill-nets. It reaches a length of 30 inches. It is never sent to market, its dark color and very rough skin rendering it unsalable, the conventional ray being light brown and nearly smooth.

30. *Raia rhina* Jordan & Gilbert.

From Monterey to Vancouver's Island; less common than the others, but not rare. It reaches a length of 32 inches. In the neighborhood of San Francisco it is sent to the city markets with *R. binoculata* and *R. inornata*; elsewhere it is rarely eaten.

31. *Raia inornata* J. & G.—*Ray*; *Skate*; *Raic*.

Very abundant about San Francisco and Monterey, where it is taken in gill-nets and seines. It reaches a length of 24 to 30 inches. It is brought into the San Francisco market in large numbers from the immediate vicinity, never being shipped from any considerable distance. The pectoral fins are alone eaten, and these chiefly by the French.

At Santa Barbara a variety or subspecies (var. *inermis*) of this form occurs in some abundance. It is similar in size and appearance, but has the spines and armature of the body and tail very little developed.

32. *Raia binoculata* Girard.—Skate; Ray.*(Raia cooperi* Grd.)

From Monterey to Alaska; everywhere common; the largest and most abundant skate on the coast. It frequents bays and sandy shores, and is taken with nets or hooks. It feeds on crustaceans and fishes. Two specimens of *Cottus polyacanthocephalus*, each a foot long, were found in the stomach of one of these skates. The egg-cases are laid in July. They are quadrate, with very short tentacles, and are nearly a foot in length. *Raia binoculata* reaches a length of 5 to 6 feet and a weight of more than 60 pounds. It is generally the commonest species in the markets of San Francisco; elsewhere it is rarely used for food, and its liver yields but very little oil.

Family TRYGONIDÆ.

33. *Urolophus halleri* Cooper.—Round Sting Ray.

From Point Concepcion southward; excessively abundant in the bays and lagoons. The bottom of portions of San Diego Bay is literally lined with these rays, who lie on the bottom nearly buried in loose sand or mud. This is the smallest, most abundant, and most dangerous of the sting-rays, striking quickly and accurately with its muscular tail. One taken in a net struck at another, the sting passing entirely through the body of the latter. This species reaches a length of 18 inches, and is never eaten.

34. *Pteroplatea marmorata* Cooper.—Ray.

From Santa Barbara southward; common in bays and along sandy shores. It reaches a length of $1\frac{1}{2}$ feet, the breadth being about $2\frac{1}{2}$. It is not usually recognized as a sting-ray, and is, therefore, frequently used as food, the larger ones taken at San Pedro being shipped to Los Angeles, where they are eaten by the French as *Raie*.

35. *Dasybatus dipterurus* Jordan & Gilbert.

Abundant in San Diego Bay; not seen elsewhere. It reaches a length of nearly 3 feet, exclusive of the tail. It is not used as food.

Family MYLIOBATIDÆ.

36. *Myliobatis californicus* Gill.—Stingaree; Sting Ray.*(Rhinoptera vespertilio* Grd.)

From Cape Mendocino southward; very abundant, especially about San Diego. Like the other species of sting-rays, it feeds on fishes and crustacea, and takes the hook readily. Its young are brought forth in July. It reaches a weight of 60 pounds or more, and is sometimes brought into the market of San Francisco.

37. *Aëtobatis laticeps* Gill.

California and southward; not obtained by us.

Family CEPHALOPTERIDÆ.

38. *Manta birostris* (Walbaum) Jordan & Gilbert.*(Ceratoptera vampyrus* Auct.)

We are informed on good authority that one or more individuals of this gigantic species have been taken by whalers near San Diego.

Family CHIMÆRIDÆ.

39. *Chimæra colliæi* Bennett—*Rat-fish*.

From Monterey northward; extremely abundant everywhere along the coast in deep bays. It feeds on fish, etc., and takes the hook very readily. It lays its eggs in July, the egg-cases being long and slender, without tentacles. It reaches a length of nearly 2 feet and a weight of 6 to 8 pounds. It is not used for any purpose. The liver is extremely large and fat, and it is said that the oil it yields is superior to any sort of shark-oil, but the fish is too small for its pursuit to be profitable.

Family ACIPENSERIDÆ.

40. *Acipenser transmontanus* Richardson.—*White Sturgeon*; *Common Sturgeon*.*(Acipenser brachyrhynchus* and *acutirostris* Ayres.)

Common in the bays and large rivers from San Francisco northward, great numbers being taken in the Sacramento, Columbia, and Frazer's Rivers. It feeds on crustacea, etc., and in Frazer's River gorges itself on the eulachon. It runs up the rivers with the salmon in the spring, and probably spawns in the summer. It reaches a length of 8 to 15 feet and a weight probably of 300 to 400 pounds. It is largely used as food, although very cheap. In the restaurants it is usually called "sea-bass". Many sturgeons are smoked and caviar is made from the roe.

41. *Acipenser medirostris* Ayres.—*Green Sturgeon*.*(Acipenser acutirostris* Gthr. non Ayres.)

This species is found in the same waters as the preceding, but is much less abundant. It reaches probably a similar size. It is not used as food, being reputed "poisonous" by the fishermen. Seen by us at San Francisco and Astoria.

Family MURÆNIDÆ.

42. *Muræna mordax* Ayres.—*Conger Eel*; *Congaree*.

From Point Concepcion southward; abundant about all the Santa Barbara Islands. It lives among rocks near low-tide mark and takes the hook readily. It may sometimes be found on land at low tide. It is extremely pugnacious, "striking from the shoulder" like a snake. It reaches a length of about 5 feet and a weight of 15 to 20 pounds. It is used as food and the flesh is very fat, resembling that of *Anguilla*. Its skin is said to be poisonous ("very pizen") by the fisherman.

Family ANGUILLIDÆ.

43. *Myrichthys tigrinus* Girard.

Recorded from Adair Bay, Oregon; unknown to us.

44. *Ophichthys triserialis* (Kaup) Gthr.

Dr. Cooper informs me that he has taken this species on the coast. A specimen from Lower California (the type of "*Ophisurus californiensis*" Garrett) is in the Museum of the California Academy of Sciences.

Family NEMICHTHYIDÆ.

45. *Nemichthys avocetta* Jordan & Gilbert.

A single specimen, 22 inches in length, was taken at Port Gamble, in Puget Sound, and presented to the National Museum by President Anderson, of the University of Washington.

Family ALBULIDÆ.

46. *Albula vulpes* (Linnaeus) Goode.

Rather common in San Diego Bay, running in schools. It spawns late in summer. It reaches a length of about a foot. It is sold with the mullet when taken, and from its bright silvery coloration meets with a ready sale. It is, however, dry and bony, and but indifferent food.

Family CLUPEIDÆ.

47. *Clupea mirabilis* Girard.—*Herring*.

Everywhere exceedingly abundant along the whole coast, especially northward; found south of Point Concepcion in winter only. At San Diego it spawns in January; further north much later. It is similar in size and value to the Atlantic herring, and, like it, is largely smoked or salted. The price in spring and summer is usually very low.

48. *Clupea sagax* Jenyns.—*Sardine; Sadma*.

Whole coast; very abundant southward, especially in winter. It is most common at San Diego, where it is taken with hook and line from the wharves. It reaches a length of about 9 inches, and is considered a rather better food-fish than the herring. No attempts have yet been made to put up this species in oil.

Family ENGRAULIDÆ.

49. *Stolephorus compressus* (Girard) J. & G.—*Sprat*.

San Pedro and San Diego Bays; very abundant, but less so than the other species. Not seen northward. It reaches a length of about 6 inches. It is not worth much as food, the flesh being full of small, stiff bones.

50. *Stolephorus delicatissimus* (Girard) J. & G.

San Diego Bay; very abundant. Not seen elsewhere. A small species, reaching a length of less than 3 inches.

51. *Stolephorus ringens* (Jenyns) J. & G.—*Anchovy*.

Abundant in clear bays for the entire length of the coast. It reaches a length of about 6 inches, and it often comes into the markets. Its chief use is, however, as bait for flounders and rock-cod. The Chinese salt them in barrels for that purpose. It is sometimes pickled with spices by the Germans, and sold as "Norsk Anchovy".

Family SALMONIDÆ.

52. *Salvelinus malma* (Walb.) J. & G.—*Dolly Varden Trout*; *Bull Trout*; *Salmon Trout*.

(*Salmo spectabilis* Grd.; *Salmo campbelli* Suckley; *Salmo lordi* Günther; *Salmo tudes* Cope; *Salmo callarias* Pallas; *Salmo bairdi* Suckley.)

Abundant in lakes and streams of the Cascade Range from Mount Shasta northward to Alaska. Large numbers are found in the salt waters of Puget Sound, where they are taken in seines and with hook and line.

In the mountains it is usually quite small; in the lakes larger. At Seattle and in Frazer's River it often reaches a weight of 12 pounds. It is an excellent food-fish. It feeds on sticklebacks (salmon-killers), herrings, and other small fish.

53. *Salmo irideus* Gibbons.—*California Brook Trout*; *Rainbow Trout*.

From Mount Shasta to San Luis Rey River, in streams of the Coast Range and west slope of the Sierra Nevada. Less common north of California, and seldom seen in salt water. It is not often sent to the market of San Francisco. It seems to be much smaller in size than the other species of the coast, rarely becoming more than 18 inches in length. The largest specimens seen are from McCloud River, and very deep bodied.

54. *Salmo gairdneri* Richardson.—*Steel-head*; *Hard-head*; *Black Salmon*.

(*Salmo truncatus* Suckley.)

Found in the mouths of the large rivers from the Columbia northward, and occasionally in the Sacramento. It appears with the salmon and is usually thought to be migratory, but is probably not so, or migratory to a small degree. It spawns later than the salmon, and most of the individuals taken during the time of the salmon run in the spring are spent, and their flesh is of no value. In other rivers than the Columbia, and at other seasons it is esteemed an excellent food-fish. Its length is about that of an ordinary Quinnet salmon; the body is less deep and the tail heavier. The usual weight is from 14 to 18 pounds. It is never canned, as the flesh is pale and grows paler when boiled, and the bones are firm and stiff.

55. *Salmo purpuratus* Pallas.—Oregon Brook Trout; Salmon Trout; Lake Trout.
(*Salmo clarki* Rich.)

Very abundant in all waters north of Mount Shasta and through the Great Basin and Rocky Mountain region; occasional southward to Santa Cruz. Found in abundance in salt water in Puget Sound and about the mouth of the Columbia. It is usually seen of but 2 to 8 or 10 pounds in weight, but occasional specimens weighing as much as 25 pounds are taken in the Columbia in summer (*C. J. Smith*). These latter are known usually as steel-heads, although the common steel-head is *S. gairdneri*; the young as brook-trout, and the partly grown as salmon-trout. This is the most widely distributed of our trout, and it is subject to many variations.

56. *Oncorhynchus kisutch* (Walb.) J. & G.—Coho Salmon of Frazer's River; Silver Salmon; Kisutch; *Biclaya Ryba*. Skewitz.

Sacramento River to Puget Sound and northward; very abundant in summer and fall. It is rarely taken in the Columbia in the spring, but great numbers run up the river in the fall. It is one of the smallest of the salmon, reaching a length of about 30 inches and a weight of 4 to 8 pounds. As a food fish it ranks with the young of *O. chouicha*, which it much resembles. It may be readily distinguished by the few (40-50) pyloric cæca. In *O. chouicha* there are about 180 pyloric cæca. In fall the males become greatly distorted and hook-jawed, and specimens in every stage can be found in late summer.

57. *Oncorhynchus chouicha* (Walb.) J. & G.—Quinnat Salmon; King Salmon; Chouicha; Chinook Salmon; Spring Salmon; Columbia River Salmon; Sacramento Salmon; Winter Salmon; White Salmon. Sawkwey.

From Ventura River northward to Behring's Straits, ascending Sacramento, Rogue's, Klamath, Columbia, and Frazer's Rivers in spring, as well as the streams of Alaska, Kamtschatka, Japan, and Northern China; in fall ascending these and probably *all* other rivers in greater or less abundance; the young taken in Monterey Bay, Puget Sound, etc., in summer in considerable numbers. This salmon, by far the most important fish in our Pacific waters, reaches a weight of about 70 pounds. The average in the Columbia River is about 22 pounds; in the Sacramento River about 18; in other rivers usually still smaller.

58. *Oncorhynchus nerka* (Walbaum) Gill & Jordan.—Blue-back; Sukkeye; Red-fish; Rascal; Frazer's River Salmon; *Krasnaya Ryba*.

From Columbia River to the Aleutian Islands; the principal salmon of Frazer's River; unknown in Eel River, Rogue River, and in the Sacramento. In the Columbia River it is much less abundant than the Quinnat salmon, and its flesh is less firm and paler. It reaches a weight of 5 to 8 pounds, four "blue-backs" being counted at the canneries equal to one Chinook salmon. It runs chiefly in the spring, few of them being seen on Frazer's River or the Columbia in the fall. Like the Quinnat it ascends streams to great distances. It is known in the

fall as red-fish. In the upper courses of the Columbia and Frazer's River, this species and the preceding are the only salmon found. The blue-back, in all its protean forms, can readily be distinguished by the much longer and more numerous gill-rakers.

59. *Oncorhynchus keta* (Walb.) G. & J.—*Dog Salmon*; *Quarlsch*; *Kayko*; *Le Kai*.

San Francisco to Behring's Straits; very abundant in the fall, when it runs in all streams, but not to a great distance. Not seen by us anywhere in the spring. It reaches a weight of 12 to 20 pounds. As it is taken only in fall, after the development of the organs of generation has caused the deterioration of the flesh, it has little economic value. Considerable numbers are salted or dried by the Indians.

60. *Oncorhynchus gorbuscha* (Walbaum) Gill & Jordan.—*Humpback Salmon*; *Haddo*; *Hone*; *Holia*.

Sacramento River northward to the Arctic Sea; abundant in Puget Sound on alternate years, 1880 being a year of scarcity. Occasionally seen in the Columbia and Sacramento, but not sufficiently abundant to constitute a distinct run. It reaches a weight of 3 to 7 pounds, being the smallest of the salmon. The females are canned in summer and fall, the hook-jawed males being rejected.

The following table gives some of the specific characters of the species of *Oncorhynchus*. The figures given are the averages of variation, so far as known:

Name.	Number of gill-rakers.	Number of anal rays (developed).	Number of pyloric cæca.	Number of scales in a longitudinal series.	Number of branchiostegals.	Average weight (pounds).	Markings.
Kisutch	10 13	13	70	128	13-14	6	Back spotted; tail unspotted, except upper ray.
Chonicha	10 14	16	160	142	15-19	20	Back and tail spotted.
Keta.....	9 14	15	160	145	13-14	12	Dorsal region with fine spots, which are often obsolete.
Nerka	16 23	14	80	132	13-15	6	No spots anywhere in spring; young with vague spots on back; tail speckled in fall.
Gorbuscha.....	11 17	14	225	180	12	4	Back and tail spotted.

61. *Hypomesus pretiosus* (Girard) Gill.—*Surf Smelt*.

From Monterey to Alaska; very abundant north of San Francisco, and often seen in the San Francisco markets. It deposits its spawn in the surf in the spring. It reaches a length of nearly a foot and becomes

very fat. As a pan-fish it ranks very high, being scarcely inferior to the eulachon. The *Hypomesus olidus* of Kamtschatka has been shown by Dr. Bean to be a different species, spawning in fresh waters.

62. *Thaleichthys pacificus* (Richardson) Grd.—*Eulachon*; *Hoolakin*; *Candle-fish*; *Grease-fish*; *Smelt*.

From Oregon northward, ascending the rivers in spring in enormous numbers, but not for a great distance. It is especially numerous in Frazer's River and Nass River, and very many ascend the Columbia. The run in Frazer's River takes place in May. They are exceedingly fat, and when dry are said to burn like a candle. On Nass River is a factory for the manufacture of eulachon oil, intended as a substitute for cod-liver oil. The fact that eulachon oil is semi-solid or lard-like at ordinary temperature is a serious hindrance to its salability for this purpose. When fresh, the eulachon is one of the very finest of pan-fishes, and many of them are sent to the markets of Victoria. Pickled eulachons are sent to San Francisco. It reaches a length of a little less than a foot.

63. *Osmerus thaleichthys* Ayres.—*Smelt*.

From Monterey northward; rather common, but not in such great numbers as the surf-smelt and the eulachon. It is smaller and less valuable than these. Little distinctive is known of its habits. Those brought into market are usually soft, and are less salable than the spurious "smelt," *Atherinopsis*, with which they are often mixed. It is rarely more than 6 inches in length.

64. *Osmerus attenuatus* Lockington.—*Smelt*.

Everywhere found with the preceding and scarcely less common. Nothing distinctive is known of its habits, and it may possibly turn out to be the female of the same species.

Family ALEPIDOSAURIDÆ.

65. *Alepidosaurus borealis* Gill.—*Hand-saw Fish*.

Puget Sound and northward, in deep water; cast on shore by storms. A head from Puget Sound in the Museum of the California Academy of Sciences, and another from the Aleutian Islands in the Museum of the Alaska Commercial Company.

Family PARALEPIDÆ.

66. *Sudis ringens* Jordan & Gilbert.

Known only from one specimen, about 8 inches in length, from the stomach of a *Merluccius*, itself in the stomach of an *Orcynus alalonga*, in Santa Barbara Channel.

67. *Paralepis coruscans* J. & G.

One specimen obtained at Port Townsend, Wash. It is very close to *Paralepis borealis* Reinh. from Greenland, if not identical with it.

Family SCOPELIDÆ.

68. *Synodus lucioceps* (Ayres) Gill.—*Dingarce Dock*.

From San Francisco southward; rather common in summer and sometimes brought into the markets. It reaches a length of about a foot, and is not much valued as a food-fish. This species differs from the Atlantic *Synodus fatens* in the much greater number of scales in a vertical series, and in the longer pectorals, as well as in lesser details. The distinctive characters given by Ayres are mostly fallacious.

69. *Myctophum crenulare* Jordan & Gilbert.

One specimen, 2½ inches in length, taken from the stomach of *Oreynus alalonga*, in Santa Barbara Channel, in July. Another obtained off Vancouver's Island has been recorded by Dr. Bean.

Family CYPRINODONTIDÆ.

70. *Cyprinodon californiensis* Girard.

Described from San Diego. Only the original types known.

71. *Fundulus parvipinnis* Girard.

From Point Concepcion southward; exceedingly abundant in muddy bays and lagoons, especially at the mouths of streams. The males in summer have the scales rough with small corneous appendages much as in some *Cyprinidae*. This species reaches a length of 2½ inches, and is used for no purpose.

Family SCOMBERESOCIDÆ.

72. *Exocoetus californicus* Cooper.—*Flying-fish*; *Volador*.

In great schools in summer, ranging north to Point Concepcion, and very abundant about all the Santa Barbara Islands. It flies for a distance sometimes of nearly a quarter of a mile, usually not rising more than 3 or 4 feet. Its motion in the water is extremely rapid, and its motive power is certainly chiefly due to the movement of its powerful tail in the water. On rising from the water the movements of the tail are continued for some seconds until the whole body is out of the water. While the tail is in motion the pectorals are in a state of very rapid vibration and the ventrals are folded. When the action of the tail ceases, the pectorals and ventrals are spread, and, so far as we can see, held at rest. When the fish begins to fall, the tail touches the water and the motion of the pectorals recommences. When on the wing it resembles a huge dragon-fly. Its motion is very swift. At first it is in a straight line, but this becomes deflected to a curve, the pectoral on the inner side of the arc being bent downward. It is able to some extent to turn its course to shy off from a vessel. The motion seems to have no refer-

ence to the direction of the wind, and we observed it best from the bow of a steamer off Santa Catalina Island in early morning, when both air and water were free from motion.

The flying-fish reaches a length of 15 inches and a weight of about 1½ pounds. It is considered an excellent food-fish, and is taken in large numbers off Santa Catalina for the market of Los Angeles. It appears only about the middle of summer, which is its season of spawning. Nine-tenths of those seen by us in July were males.

73. *Hemirhamphus rosæ* Jordan & Gilbert.

Rather abundant in San Pedro and San Diego Bays, swimming slowly about near the surface. It reaches a length of probably not over a foot, and is used for no purpose.

74. *Scomberesox brevirostris* Peters.

One specimen taken in Monterey Bay. Recorded by Dr. Ayres from Tomales Bay.

75. *Tylosurus exilis* (Grd.) J. & G.—*Needle-fish* ; *Gar-fish*.

From Santa Barbara southward; rather common in summer, especially in San Diego Bay. It lives in sheltered bays, swimming near the surface. It spawns in August. It reaches a length of about 2½ feet, and is esteemed a good food-fish.

Family MUGILIDÆ.

76. *Mugil albula* L. (*Mugil mexicanus* Steindachner).—*Mullet* ; *Chub*.

From Monterey southward; very abundant in San Diego Bay. It ascends all creeks and lagoons in winter, and many of them become land-locked and are destroyed by the pelicans. It is said to be spreading northward along the coast, and to have first appeared at San Pedro about three years ago. It reaches a length of about 15 inches, and when taken in clear water is much esteemed. Many of those brought into the market are seined in muddy lagoons, and the flavor of the water is imparted to the flesh of the mullet. Like other mullets, this species feeds on mud. It is not obviously different from the common mullet of the Atlantic coast.

Family ATHERINIDÆ.

77. *Leuresthes tenuis* (Ayres) Jordan & Gilbert.

Seen at San Diego only; in some parts of the bay occurring in immense schools, but not generally common. This is one of the smaller species of the family, reaching a length of rarely more than 4 inches.

78. *Atherinops affinis* (Ayres) Steindachner.—*Little Smelt* ; *Petite Smelt*.

Cape Mendocino southward; abundant, especially in bays and lagoons, generally preferring more sheltered places than the next species. It reaches a length of about a foot, and is a pan-fish of good quality, having firm, white flesh, which is rather dry. Many of them are dried by the Chinese.

79. *Atherinopsis californiensis* Girard.—*Common Smelt*.

From Cape Mendocino southward; very abundant, being taken with the seine in great numbers in all open bays. It is also often taken by trolling with a small hook. It reaches a length of about 18 inches, and is one of the most important food-fishes on the coast. Its flesh is firm, white, and delicate, but rather dry. The genus *Atherinopsis* is distinguished by its non-protractile premaxillaries.

Family SPHYRÆNIDÆ.

80. *Sphyræna argentea* Girard.—*Barracuda*; *Barracuta*.

Abundant in summer from San Francisco southward, especially about Monterey (Soquel) and the Santa Barbara Islands. The chief run is in July. It spawns in August, and then disappears, probably retiring into deeper water, or perhaps moving southward. It is taken chiefly by trolling at a distance of 3 or more miles from the mainland. About the islands it may be sometimes taken by still-fishing. The young are often taken in seines in winter. It reaches a length of about 3 feet and a weight of about 12 pounds. It is considered one of the best food-fish, and when salted and dried sells at a higher price than any other, even than the Alaska cod-fish.

Family AMMODYTIDÆ.

81. *Ammodytes personatus* Girard.—*Sand Lant*; *Sand Lance*.

Abundant along sandy shores from Monterey to Alaska. Found in immense schools in Puget Sound. It burrows in the sand between tide-marks. It reaches a length of 5 or 6 inches, and is sometimes taken for bait.

Family ECHENEIDÆ.

82. *Remora jacobœa* (Lowe) Gill.

A single specimen seen in the market at San Francisco. It is probably not uncommon.

83. *Echeneis naucrates* L.

Occasionally taken about San Francisco.

Family XIPHIIDÆ.

84. *Xiphias gladius* Linné.—*Sword-fish*; *Espada*.

Occasionally seen about Santa Catalina and the Coronados, but never taken, the fishermen having no suitable tackle. One seen by us off Santa Monica about 8 feet in length.

Family SCOMBRIDÆ.

85. *Scomber scombrus* Linné.—*Eastern Mackerel*.

Not seen by us. Capt. Charles Willoughby, Indian agent at Neah Bay, formerly a mackerel-fisher in Massachusetts, informs us that he

once netted a school of true eastern mackerel off Santa Catalina Island. J. Weinmiller, of Santa Barbara, has also taken them occasionally off Anacapa Island. There is little doubt of the casual occurrence of this species on our Pacific coast.

87. *Scomber pneumatophorus* Delaroché.—*Easter Mackerel*; *Tinker Mackerel*; *Little Mackerel*.

(*Scomber diego* Ayres; *Scomber deKayi* Storer.)

From Monterey southward; coming in irregular and often large schools in summer and fall. It reaches a length of a little more than a foot.

88. *Orcynus alalonga* (Gmelin) Risso.—*Albicore*.

(*Orcynus pacificus* Cooper; *Thynnus pacificus* C. & V.)

From San Francisco southward; abundant in summer south of Point Concepcion and taken by trolling. It is found in deeper water than the bonito, being rarely taken within 6 miles of the shore. It feeds on anchovy and squid, and occasionally rare deep-water fishes are found in its stomach. It is shorter and deeper than the bonito, weighing 12 to 15 pounds. It is little valued as a food-fish, selling at about 25 cents. It is caught chiefly for sport, as it is a very gamy fish.

Another *Orcynus*, known as the "tuna", exists about Santa Cruz Island, but we failed to obtain it.

89. *Sarda chilensis* (Cuvier & Valenciennes) J. & G.—*Bonito*; *Spanish Mackerel*; *Skipjack*; *Tuna*.

From Monterey southward; very abundant everywhere in summer, when it is taken in great numbers, by trolling, at a distance of 2 or 3 miles from shore. It is extensively salted and dried, but the flesh is rather coarse, and it brings a lower price than the yellow-tail and barracuda. It reaches a weight of about 12 pounds and sells at about 25 cents. After the spawning season the young are very abundant in the kelp.

90. *Scomberomorus concolor* (Lockington) Jordan & Gilbert.

Monterey Bay. It comes to the market at San Francisco from Soquel every year, but in small numbers. Rarely more than 18 or 20 come in in a single season. This year (1880) upwards of 40 were taken, nearly half of which were secured by us. Its usual price in the market of San Francisco is about \$2.50. The female is marked by two rows of alternating, round, bronze spots about the size of the pupil.

Family CORYPHÆNIDÆ.

91. *Coryphæna* (species).

A dolphin came ashore in a storm at Cayucos a few years since. Its captor and eater informs us that he is well acquainted with the dolphin in Mexican waters, and that this was the same fish.

Family STROMATEIDÆ.

92. *Stromateus simillimus* Ayres.—*Pompano*.

Entire coast; common, but most abundant from Santa Barbara to San Francisco. Its movements on the coast are very irregular. It is usually scarce in winter everywhere, and it is said that it was formerly much less abundant than now. It is taken in seines, and also by hook and line or grab-hook from the wharves. It is usually esteemed as the best pan-fish on the coast, and always brings a high price—25 to 50 cents per pound. It reaches a length of 8 inches and a weight of little more than half a pound.

Family CARANGIDÆ.

93. *Seriola lalandi* Cuvier & Valenciennes.—*Yellow Tail*; *White Salmon*; *Cavasina*.
(*Seriola mazaflana* Steindachner.)

Only about the Santa Barbara and Coronados Islands, where it is abundant in summer, spawning in July and August; not seen in winter. It is taken by trolling only. As a fresh fish it ranks high. When salted it is graded as best, with *Dekaya* and *Sphyrana*. It feeds on squid and various small fishes, and reaches a weight of 40 to 50 pounds and a length of 4 to 5 feet. The "horse-mackerel, *Halatractus dorsalis*", referred to by Dr. Cooper in Cronise's Natural Wealth of California, is undoubtedly the present species.

94. *Caranx caballus* Günther.

(*Trachurus boops* Grd.)

Only the original type of Girard's description has been taken on our coast.

95. *Trachurus plumierianus* (Lacépède) J. & G.—*Horse Mackerel*.

(*Trachurus trachurus* Günther; *Trachurus symmetricus* Ayres.)

Very abundant in summer as far north as Monterey. It is taken in seines in large numbers and used chiefly for bait. Many of them are salted for this purpose. It reaches a length of about a foot and a weight of less than a pound.

Specimens of this species from Monterey and from Venice are not obviously different. The individual variations in the curvature of the lateral line are considerable.

Family SERRANIDÆ.

96. *Serranus maculofasciatus* Steindachner.—*Cabrilla*; *Rock Cod*; *Rock Bass*.

San Pedro to San Diego and southward; abundant in the bays, especially at San Diego, where many are taken in seines, and with hook and line from the wharves. Not seen northward and not found in deep water or about the islands. It feeds chiefly on crustaceans and squid. It reaches a length of about 15 inches and a weight of 2 or 3 pounds, and is considered an excellent food-fish.

97. *Serranus nebulifer* (Grd.) Steind.—*Johnny Verde*; *Cabrilla*; *Rock Bass*.

From Monterey Bay southward; common about San Pedro and in San Diego Bay with the preceding. It reaches a length of 18 inches and a weight of 3 to 4 pounds, and is considered a good food-fish.

98. *Serranus clathratus* (Grd.) Steind.—*Cabrilla*; *Rock Bass*; *Kelp Salmon*.

From San Francisco southward; very abundant south of Point Concepcion. One of the most common food-fishes about the islands. It feeds on crustacea and squid, and is found in not very deep water, chiefly about rocks. It reaches a length of 18 inches and a weight of about 5 pounds. It is considered one of the better class of food-fishes. It is not often split and salted.

99. *Stereolepis gigas* Ayres.—*Jew-fish*; *Black Sea Bass*.

From the Farallones southward, chiefly about the islands; not rare, but from its great size not very often taken. Taken by still-fishing, not by trolling. It attains a weight of 400 to 500 pounds. Often taken by swallowing white fish, etc., when the latter are on the hook.

Family PRISTIPOMATIDÆ.

100. *Xenichthys californiensis* Steind.

Described from San Diego. No specimens obtained by us.

101. *Pristipoma davidsoni* Steindachner.—*Sargo*.

San Pedro to San Diego; not common. Four seen by us at San Pedro. Probably only taken in summer, and then in small numbers. Feeds on crustacea. Reaches a length of somewhat more than a foot.

Family SPARIDÆ.

102. *Scorpius californiensis* Steindachner.—*Media-luna*; *Half-moon*.

Santa Barbara Islands and southward. Especially abundant about Catalina, where it is one of the principal food fishes, being taken in great numbers in gill-nets. Rare at Santa Cruz Island, and probably not found northward. One in the Museum of the California Academy said to come from Tomales Bay. Feeds chiefly on crustacea. It reaches a length of about a foot and a weight of 3 pounds. It is not often dried, but ranks high as a pan-fish.

103. *Girella nigricans* (Ayres) Gill.—*Blue-fish*.

From Monterey southward; abundant about the Santa Barbara Islands, where it is an important food-fish. Taken chiefly in gill-nets. It is entirely herbivorous. It is very tenacious of life, but begins to soften soon after death. It reaches a length of about a foot and a weight of 4 pounds. It is considered a fair pan-fish.

Family EPHIPPIDÆ.

104. *Chætodipterus faber* (Bloch) Bleeker.

Described from San Diego as *Ephippus zonatus* Grd. Not obtained by us.

Family SCLÆNIDÆ.

105. *Seriphus politus* Ayres.—*Queen-fish*; *King-fish*.

From San Francisco southward; abundant in summer. Found along sandy shores and taken with seines, sometimes in great numbers, notably at Santa Barbara and Soquel. It is considered the best of the small Sclænoids, but is too small to be of very great importance. It reaches a length of 8 inches, but is usually still smaller.

106. *Cynoscion parvipinne* Ayres.—*Blue-fish*; *Corvina*; *Cararina*; *Sea Bass*.

(*Otolithus magdalena* Steind.)

From San Pedro southward; very abundant at San Diego. It frequents the bays, and is taken in seines and gill-nets. It feeds chiefly on crustacea. Its flesh is extremely good when fresh, but it soon softens, being similar to that of the weak-fish (*C. regale*) in that respect. It reaches a length of about 2 feet and a weight of 8 pounds.

107. *Atractoscion nobile* (Ayres) Gill.—*White Sea Bass*; *Sea Bass*; *Sea Trout* (yg.); *Corvina*.

(*Otolithus californiensis* Steind.)

From San Francisco southward; very abundant in spring and summer; not often seen in winter; only adults usually taken in spring. Caught by trolling and in gill-nets, the young in summer by seines. It reaches a length of 4 feet and a weight of 50 pounds or more. Its flesh is highly esteemed, and is much firmer than that of the eastern weak-fish. The food consists of crustacea, anchovies, etc.

The young ("sea trout") is often considered by fishermen as a distinct species.

108. *Menticirrus undulatus* (Grd.) Gill.—*Bagre*; *Sucker*; *Sucker Bass*.

From Santa Barbara southward; abundant; taken in seines and gill-nets along sandy shores. It reaches a length of 18 inches and a weight of 2½ pounds. It is held in moderate esteem as a food-fish. It feeds largely on crustacea. Girard's type of *Umbrina undulata* is a very young specimen of this species.

109. *Umbrina xanti* Gill.—*Yellow-finned Roncador*; *Yellow-tail Roncador*.

From Santa Barbara southward; generally abundant. Found along sandy shores, and taken in seines and gill-nets. It feeds on crustacea, squids, etc., and spawns in July. It reaches a length of about a foot and a weight of nearly 2 pounds. It is considered a food-fish of good quality, and many are split and salted at San Pedro.

110. Roncador stearnsi (Steind.) J. & G.—*Roncador*; *Croaker*.

From Santa Barbara southward; generally abundant on sandy shores, in rather deeper water than the *Umbrina*. Taken chiefly in the gill-nets. It feeds mostly on crustacea, and spawns in July. It reaches a length of about 2 feet and a weight of 5 or 6 pounds. It is considered a good food-fish.

111. Corvina saturna (Grd.) Gthr.—*Red Roncador*; *Black Roncador*.

From Santa Barbara southward; in similar situations with the preceding, but less abundant. It reaches a length of 16 to 18 inches and a weight of 3 pounds. Like the *Menticirrhus* it is less attractive in color than *Umbrina* and *Roncador*, but is probably similar in flesh.

112. Genyonemus lineatus (Ayres) Gill.—*Little Bass*; *Little Roncador*.

From San Francisco southward; not common in winter, but excessively abundant in summer, especially from Santa Barbara northward. It lives between the shore and the kelp, and is taken with hook and line at the border of the kelp, and also in great numbers in seines. Its food is chiefly crustacea. It reaches a length of less than a foot and a weight of nearly a pound. It is rather soft, and not much valued as food, although excellent when fresh. Many are dried by the Chinese.

Family EMBIOTOCIDÆ.

(*Perch*; *Surf-fish*.)

The fishes of this family are exceedingly abundant along our entire Pacific coast, the centre of distribution being from Santa Barbara to San Francisco. They all go by the general name of perch, and the fishermen rarely make any distinction of the species. All are ovoviviparous, bringing forth their young, 15 to 20 at a time, in spring or early summer. The young are then $1\frac{1}{2}$ to $2\frac{1}{2}$ inches in length, and perfectly able to take care of themselves. At birth they closely resemble the adult fish, but are redder, more compressed, and with higher fins. The flesh of the Embiotocoids is very similar in all the species, being flavorless and poor.

113. Rhacochilus toxotes Agassiz.—*Alftone*; *Sprat*; *Perch*.

San Pedro to San Francisco; rather common, especially about Soquel. Like the other species of the family, it feeds on crustacea and small fish. This species is the largest of the family, reaching a weight of 4 pounds, and is considered the best of this very inferior group.

114. Damalichthys argyrosomus (Girard) J. & G.—*White Perch*.

From San Pedro to Puget Sound; generally common and exceedingly abundant in Puget Sound; next to *Ditrema laterale* and *Micrometrus aggregatus*, the species most numerous in individuals on the coast. It is considered as, next to the preceding, the best of the *Embiotocidæ*, and reaches a weight of 2 pounds.

The genus *Damalichthys* is distinguished from *Ditrema* by the extraordinary development of the pharyngeal bones.

115. *Ditrema furcatum* (Grd.) Gthr.

San Diego to San Francisco; exceedingly abundant everywhere. Not noticed northward. It lives in sheltered bays and is taken with seines. It rarely reaches a pound weight, and is little esteemed.

116. *Ditrema atripes* J & G.

Monterey Bay; abundant at Monterey, where large numbers are taken in seines. It reaches the weight of $1\frac{1}{4}$ pounds.

117. *Ditrema laterale* (Agassiz) Gthr.—*Perch*; *Surf-fish*; *Blue Perch*

Santa Barbara to Puget Sound; very abundant. Northward the most common of the larger species. It reaches a weight of 2 pounds, and is an important market fish, although poor and watery.

118. *Ditrema jacksoni* (Agassiz) Gthr.—*Perch*; *Croaker*; *Surf-fish*.

San Diego to Puget Sound; scarce north of San Francisco, but extremely abundant south of Point Concepcion, and brought in large numbers to the markets. It reaches a weight of $1\frac{1}{2}$ pounds, and is about as poor as the rest of the tribe.

119. *Hypsurus caryi* (L. Agassiz) A. Agassiz.—*Bugara*.

Tomales to Santa Barbara; generally very abundant in the edge of the kelp, especially at Monterey. It is often taken with hook and line or baited dip-nets, and sometimes in great numbers in seines. It is used chiefly for bait for rock cod, the larger ones being sent to the markets. It rarely weighs more than half a pound. In color it is one of the most brilliant and attractive.

120. *Amphistichus argenteus* Agassiz.—*Surf-fish*; *White Perch*.

Tomales to San Diego; locally very common on sandy shores, especially in the surf; more abundant at Soquel and Santa Barbara than elsewhere. It reaches a weight of $1\frac{1}{2}$ pounds.

121. *Holconotus rhodotus* Ag.

Tomales to Santa Barbara; not so common as most of the other species, but often locally abundant; most numerous at Soquel. It reaches a weight of nearly $1\frac{1}{2}$ pounds.

122. *Holconotus agassizi* (Gill) J. & G.

Tomales to Santa Barbara; in abundance and distribution similar to the preceding species. It rarely weighs over $\frac{1}{2}$ pound.

123. *Holconotus argenteus* (Gibbons) J. & G.—*Wall-eye*; *White Perch*.

San Diego to Tomales; everywhere abundant. Taken with seines in great numbers in sandy shores, and often with hook and line from the wharves. It weighs about $\frac{1}{2}$ pound, and is little esteemed.

124. *Holconotus analis* (A. Agassiz) J. & G.

San Francisco to San Luis Obispo; only locally abundant. Common only at Soquel and Santa Cruz, where it is largely taken, with *Micrometrus*, as bait for rock-fish, etc. It weighs less than $\frac{1}{4}$ pound, and seldom comes into the markets.

125. *Brachyistius rosaceus* J. & G.

About San Francisco; occasionally brought in with sweep-nets; not seen elsewhere. Its weight is usually less than $\frac{1}{2}$ pound. It is the most brightly colored of the *Embiotocidae*.

126. *Brachyistius frenatus* Gill.

From Catalina Island to Puget Sound; widely distributed and often locally very abundant, as at Monterey, Point Reyes, etc. It is used chiefly for bait, never coming into the markets except by accident when mixed with other fish. Weight $\frac{1}{4}$ pound.

127. *Micrometrus aggregatus* Gibbons.—*Shiner*; *Sparada*; *Minnie*; *Little Perch*.

Entire coast from San Diego to Puget Sound; everywhere the most abundant species of the group. Found especially in sheltered bays. It weighs less than $\frac{1}{4}$ pound, and is used only for bait.

128. *Abeona aurora* J. & G.

Known only from Monterey Bay, where it is very abundant about rocks. Many of them inhabit the larger rock-pools at Point Pinos. It reaches a weight of about $\frac{1}{3}$ pound, and is occasionally sent to the San Francisco market.

129. *Abeona minima* (Gibbons) Gill.—*Shiner*.

Tonales to San Diego; rather common, but less abundant than most of the other species. It is the smallest of the tribe, rarely weighing $\frac{1}{4}$ pound. The genus *Abeona* is distinguished from *Cynatogaster* by its trilobate incisor-like teeth.

130. *Hysterocarpus traski* Gibbons.—*Fresh-water Perch*.

Sacramento and San Joaquin Rivers, and streams southward as far as San Luis Obispo; probably abundant. Many are brought into the market of San Francisco, where they are eaten chiefly by the Chinese. It reaches a weight of less than $\frac{1}{2}$ pound.

Family LABRIDÆ.

131. *Pimelometopon pulcher* (Ayres) Gill.—*Red-fish*; *Fat head*.

Point Concepcion southward; very abundant in the kelp, and taken in immense numbers by the Chinamen, who salt and dry them. It feeds on crustacea and shells. The flesh is rather coarse, but the fat forehead is esteemed for chowder. It reaches a weight of 12 to 15 pounds. Rare instances of its occurrence at Monterey are on record.

132. *PlatyGLOSSUS semicinctus* (Ayres) Günther.—*Kelp-fish*.

Santa Catalina and southward; not rare in the kelp; occasionally taken in the gill-nets at San Pedro, and sometimes with a hook. It reaches a weight of about a pound.

133. *OxyJULIS modestus* (Grd.) Gill.—*Scōiorita*; *Pesca Rey*.

From Monterey southward; common in the kelp, and often taken with hook or line or baited dip-net. It reaches a weight of little more than $\frac{1}{4}$ pound, and is used chiefly for bait, although said to have flesh of fine quality.

Family POMACENTRIDÆ.

134. *Chromis punctipinnis* Cooper.—*Blacksmith*.

Santa Barbara Islands and southward; abundant; taken with gill-nets or hook and line. It feeds, like the other species, on shells and crabs. It is not much valued as food, and reaches a weight of about 2 pounds.

The record by Yarrow and Henshaw of *Chromis atrilobata* Gill from Santa Barbara refers to this fish. (Wheeler's Surv., Appendix NN, Ann. Rept. Chief Engin., 1878, 203.)

135. *Hypsypops rubicundus* (Grd.) Gill.—*Garibaldi*; *Red Perch*; *Gold-fish*.

Abundant about the Santa Barbara Islands and southward; taken chiefly with gill-nets. It reaches a weight of 3 to 4 pounds, and is not held in very high esteem as a food-fish, although gorgeously colored.

Family TRACHYPTERIDÆ.

136. *Trachypterus ?altivelis* Kner.—*King of the Salmon*.

Comes ashore occasionally when pursued by other fishes or after storms. The Makah Indians consider them the kings of the salmon, and will not let any one eat them.

Three specimens are certainly known—one from Santa Cruz (Dr. C. L. Anderson), and two from Neah Bay (Judge J. G. Swan). The specimen from Santa Cruz, about a foot long, examined by us, is evidently close to *T. altivelis*, the differences noticed being perhaps due to age.

Family ICOSTEIDÆ.

137. *icosteus ænigmaticus* Lockington.

San Francisco and northward, in deep water; two found in San Francisco market; one in University of California from the coast of Northern California. It reaches a length of about 10 inches.

138. *icichthys lockingtoni* J. & G.

San Francisco and northward, in deep water. The only specimen known, found in the market at San Francisco, is about 8 inches long.

139. *Bathymaster signatus* Cope.—*Rouchil*.

Puget Sound and northward, in deep water; taken with hook and

line about Seattle, in some abundance on a reef of ballast rocks, in deep water, tolerably abundant. It reaches a length of 6 to 8 inches, and is used chiefly for bait.

Family LATILIDÆ.

140. *Dekaya* * *princeps* (Jenyns) J. & G.—*White-fish*; *Yellow-tail*.

From Monterey southward; abundant about all the islands, but only occasional at Monterey. It feeds largely on crustacea. It is taken chiefly with hook and line from reefs. Many of them are salted and dried both by Americans and Chinese. As a salted fish it ranks high; as a fresh fish of fair grade. It reaches a length of over 2 feet and a weight of 10 to 14 pounds.

Family TRACHINIDÆ.

141. *Trichodon stelleri* C. & V.

Alaska; occasionally southward to San Francisco; not seen by us from this coast. A specimen in Alaska Commercial Company's collection from Aleutian Islands.

Family GOBIIDÆ.

142. *Gillichthys mirabilis* Cooper.—*Mud-fish*.

From San Francisco southward, abounding in the muddy bottom of creeks and slimy lagoons into which the tide flows; very abundant about Oakland and at San Pedro and San Diego. It burrows into the mud, the bottoms being honeycombed with its holes. Two small specimens of a species of this genus were taken in the stomach of a *Hexagrammus stelleri*, in Saanich Arm, Vancouver's Island. It reaches a length of 5 or 6 inches. It may readily be taken with a small hook. Mr. Charles R. Orcutt obtained them for us in a creek near San Diego at the rate of 50 per hour.

143. *Eucyclogobius newberryi* (Grd.) Gill.

Not obtained by us. Described from Tomales Bay.

144. *Lepidogobius gracilis* (Grd.) Gill.

From San Francisco northward; occasionally taken in the sweep-nets with the tom-cod, and thus brought into the markets; seen by us at San Francisco and Victoria. It reaches a length of 4 inches. Nothing special is known of its habits.

145. *Gobius glaucofrenum* (Gill) J. & G.

Not seen by us. Described from Puget Sound.

146. *Othonops eos* Rosa Smith.

The specimens known found burrowing in sand among rocks about Point Loma, near San Diego. Locally very abundant.

Family CHIRIDÆ.

147. *Anoplopoma fimbria* (Pallas) Gill.—*Horse Mackerel; Candle-fish; Beshowe.*

From Monterey northward; generally common, especially in Puget Sound, where many are taken from the wharves, especially at Seattle. Taken by the Chinese at Monterey with set-lines, in rather deep water, and about San Francisco in winter with sweep-nets. It feeds on crustacea, worms, and small fish, and reaches a length of 40 inches and a weight of 15 pounds; those usually seen rarely exceed 2 or 3 pounds. As a food-fish it is generally held in low esteem, although sometimes fraudulently sold as "Spanish mackerel". The large specimens taken in deep water about Vancouver's Island, known to the Makah Indians as Beshowe, are highly valued as food-fish, according to Mr. Swan.

148. *Myriolepis zonifer* Lockington.

The only specimen known came from Monterey Bay. It is about 10 inches in length.

149. *Oxylebius pictus* Gill.

From Monterey northward, living among rocks near shore, in clear waters; not very rare, but from its small mouth and peculiar habits very rarely taken except for bait in dip-nets baited with crushed crabs. Seen by us at San Francisco, Monterey, and Saanich. It reaches a length of 6 to 8 inches, and is used only for bait.

150. *Zaniolepis latipinnis* Grd.

From San Francisco northward, in rather deep water. It is taken in large numbers in the sweep-nets of the paranzelle, and is occasionally brought into the markets of San Francisco. It feeds on crustacea, reaches a length of about a foot, and is not often eaten.

151. *Ophiodon elongatus* Grd.—*Cultus Cod; California Cod; Blue Cod; Buffalo Cod; Ling.*

From Santa Cruz Island northward; excessively abundant from Monterey to Victoria and beyond. It lives about rocky places, and is taken with hook and line or gill-net. Many are dried by the Chinese and Indians. It feeds on crustacea, squid, and various fishes. It reaches a larger size northward than about San Francisco, the greatest length being nearly 5 feet and the weight 50 or 60 pounds; most seen in market are considerably smaller. It is one of the better food-fishes, and in amount is one of the most important on the coast. Its flesh is usually of a pale livid blue.

152. *Hexagrammus decagrammus* (Pallas) J. & G.—*Boregat; Sea Trout; Bodieron; Rock Trout.*

From San Luis Obispo northward; everywhere moderately common, most so in the Bay of Monterey and off San Francisco. A common fish

of the San Francisco markets. It feeds chiefly on crustacea and worms. It dies soon after being taken from the water, and does not keep very long before softening. The fish spawns in July. The males (*Chiropsis constellatus* Grd.) and the females (*C. guttatus* Grd.) differ so much in color that they have been usually taken for distinct species. The form lately described by Mr. Lockington as *Chirus maculoscriatus* is, so far as we have noticed, always female, and it seems to vary by insensible degrees into the ordinary *guttatus*. It reaches a length of 15 inches and a weight of 2-3 pounds. It is a food-fish of fair quality, but inferior to the *Ophidon* and *Sebasticthys*.

153. *Hexagrammus superciliosus* (Pallas) J. & G.—*Sea Trout*.

From Monterey northward; not very common south of Puget Sound, and not very abundant there. In food, size, and qualities identical with the preceding. The color is quite variable and the flesh is often blue.

154. *Hexagrammus asper* Steller.—*Starling*.

(*Chirus hexagrammus* Gthr.; *Chirus trigrammus* Cope.)

From Puget Sound northward; abundant everywhere in Puget Sound. Taken in rocky places with seines and gill-nets. Intestines usually with long tænioid worms. Size and value same as that of other species. The type of *Chirus nebulosus* Girard belongs to this species. The tips of the first three soft rays have been broken off, and they were taken by Girard for spines.

Family SCORPÆNIDÆ.

155. *Sebastes paucispinis* (Ayres) Gill.—*Boccaccio*; *Merou*; *Jack*; *Tom Cod*.

Coast from San Francisco to the Santa Barbara Islands, inhabiting chiefly reefs in deep water, the young coming near shore. Taken mostly with hook and line. It feeds on various small fish. It reaches a weight of 12 to 14 pounds, and is one of the best food-fishes. Many are taken in the winter at Monterey, and in the summer the young from the wharves.

Genus SEBASTICHTHYS Gill.

The members of this extensive genus are extremely abundant on our Pacific coast, and form one of the most striking features of its fauna. All are food-fish of good quality, and are sold in the markets under the general name of rock-fish or rock-cod. All the species are ovoviviparous. The young are produced in enormous numbers, and are brought forth in early summer or spring. They are then very slender, with large eyes and imperfectly developed fins, and are from $\frac{1}{3}$ to $\frac{1}{4}$ inch in total length.

156. *Sebasticthys flavidus* (Ayres) Lockington.—*Yellow-tail*.

From San Diego to Cape Mendocino; very abundant in Monterey Bay and about San Francisco. It is found in both deep and shallow

water, and is taken in large numbers with gill-nets and set-lines. Like all the species of the genus, it feeds on crustacea and small fish. This species is one of the larger ones of the genus, reaching a weight of 6 or 7 pounds. It is considered as one of the best of the group.

157. *Sebastichthys melanops* (Grd.) Gill.—*Black Bass*.

From Monterey northward; most common in Puget Sound; not very abundant about San Francisco, but frequently seen in the markets. In size, habits, and value not essentially different from *S. flavidus*, with which species its affinities are closer than with *S. mystinus*.

158. *Sebastichthys mystinus* J. & G.—*Black Rock-fish*; *Pêche Prêtre*; *Black Bass*.

From San Diego northward; more common about Monterey and San Francisco than either northward or southward. It is found in rather shallow waters, and is mostly taken in gill-nets. It reaches a weight of 5 pounds, and from its color is less salable than the others of the group, although the flesh is probably similar. It is probably sent to San Francisco in greater numbers than any other species.

159. *Sebastichthys entomelas* J. & G.

Known only from Monterey, where it is taken with hook and line in deep water. Thus far the least abundant of the species. Similar in size and value to *flavidus*.

160. *Sebastichthys ovalis* (Ayres) Lockington.—*Viura*.

From Santa Barbara to Monterey; taken with hook and line in very deep water; one of the least abundant species. Similar in size and value to *S. flavidus*.

161. *Sebastichthys proriger* J. & G.

About Monterey and the Farallones; taken with the next species in very deep water; not rare in its haunts. One of the smallest species, not weighing more than 1½ pounds. In quality similar to other small red species.

162. *Sebastichthys elongatus* (Ayres) Gill.—*Reina*.

About Monterey and San Francisco; abundant in very deep water with the preceding. It is a small species, reaching a weight of 2 pounds, and being handsomely colored is one of the most salable species. It is not very common in the markets except in spring.

163. *Sebastichthys atrovirens* J. & G.—*Garrupa*; *Green Rock-fish*.

From San Francisco to San Diego; abundant about rocky places in rather shallow water. Taken in considerable numbers in gill-nets, especially south of Point Concepcion. Many of them are taken in the winter about the Santa Barbara Islands, and a good many are dried and salted by the Chinamen. It reaches a weight of 3 pounds, and is graded with *flavidus* and *nebulosus*.

164. *Sebastichthys pinniger* (Gill) Lockington.—*Fliaume*; *Red Rock Cod*.

From Monterey northward; abundant everywhere in deep water and taken in great numbers, chiefly with set-lines, not often with gill-nets. This is probably the most abundant red species in the San Francisco markets, and many are split and salted in the deep waters of Puget Sound. It is a large species, reaching a weight of 8 or 10 pounds. It sells as well as the other red or green species, unless too large, when the flesh is rather coarse.

165. *Sebastichthys miniatus* J. & G.—*Rasher*; *Rasciera*.

From Santa Barbara to San Francisco; found with the preceding, but often in water less deep. It is taken with hook and line and gill-nets, and is sent into the market of San Francisco in large numbers. It reaches the same size as the preceding, and is equally valuable.

166. *Sebastichthys ruber* (Ayres) Gill.—*Red Rock Cod*; *Rock-fish*; *Tambor*.

From Santa Barbara northward; most abundant in Puget Sound and about San Francisco; taken with hook and line in deep water. Large specimens seen about Victoria with the skull above infested by an encysted parasitic worm. One of the most abundant species in the San Francisco markets, and probably reaches the largest size of any—10 to 12 pounds. The large ones are very robust in form. It grades with *pinniger* and *miniatus*, from which it is not distinguished by the trade.

167. *Sebastichthys rubrivinctus* J. & G.—*Spanish Flag*.

From Santa Barbara to Monterey, about the reefs in very deep water; occasionally taken with hook and line in spring. It reaches a weight of 6 pounds. In beauty of coloration it surpasses all other fish on the coast.

168. *Sebastichthys constellatus* J. & G.—*Bagre*.

From Santa Barbara to San Francisco, in deep water; taken with hooks only; rather abundant and frequently seen in the market. It reaches a weight of 2 or 3 pounds, and ranks with *rosaceus* and other small species, and, like them, spawns at Monterey in early spring.

169. *Sebastichthys rosaceus* (Grd.) Gill.—*Corsair*.

From San Francisco to Santa Barbara (*San Diego*, Grd.), on reefs in deep water; where found the most abundant of the red species. It is one of the smallest species, rarely weighing over 1½ pounds, and is taken to the San Francisco market in great numbers.

170. *Sebastichthys rhodochloris* J. & G.—*Fly-fish*.

Monterey and the Farallones, where it occurs in deep water with the preceding in considerable abundance, and with it is occasionally sent in large numbers to the San Francisco market in the spring.

171. *Sebastichthys chlorostictus* J. & G.—*Pesce Vermiglia*.

Known from Monterey and the Farallones, where it occurs in considerable abundance with the three preceding species. It is a larger fish, reaching a weight of 4 pounds.

172. *Sebastichthys caurinus* (Rich.) J. & G.

Puget Sound northward; in habits and value similar to its Southern representative *S. vexillaris*.

173. *Sebastichthys vexillaris* J. & G.—*Red Garrupa*.

San Diego to Puget Sound; generally abundant along the coast in water of moderate depth. Taken chiefly with nets. Many are sent to the San Francisco market, it ranking with abundance only behind *ruber*, *pinniger*, *rosaceus*, *flavidus*, *mystinus*, *auriculatus*, and *carnatus*. It is one of the larger species, reaching a weight of 5 or 6 pounds.

174. *Sebastichthys auriculatus* (Grd.) Gill.—*Rock-fish*.

Santa Barbara to Puget Sound; everywhere one of the most abundant species, and always the one most frequently taken near shore. It is the only one frequenting, habitually, shallow bays and taking the hook around wharves. It is common in the San Francisco markets and reaches a weight of 3 pounds, although usually taken in San Francisco Bay at half a pound weight. It is less valued than the deep-water species as food.

175. *Sebastichthys rastrelliger* J. & G.—*Garrupa*; *Grass Rock-fish*.

From Humboldt Bay southward; abundant about the Santa Barbara Islands, where it is taken with hooks and gill-nets, but rarely with seines. It occurs in considerable numbers in the San Francisco markets. It reaches a weight of 2½ pounds, and is esteemed as the best of the family as food.

176. *Sebastichthys maliger* J & G.

From Monterey northward, in rather deep water; commonest in the Straits of Fuca, where it is taken with hook and line. It is occasionally seen in the San Francisco markets, but is one of the less common species. It is one of the largest species, reaching a weight of 6 pounds.

177. *Sebastichthys carnatus* J. & G.—*Garrupa*.

From Santa Barbara to San Francisco; abundant at Monterey, where it is taken in great numbers in rather shallow water with gill-nets. At Santa Barbara it is rare, and it has not been noticed northward. It reaches a weight of 2½ pounds, and grades with *atrovirens*, *flavidus*, *nebulosus*, etc., as fairly good.

178. *Sebastichthys chrysomelas* J. & G.—*Garrupa*.

From Santa Barbara to San Francisco; rather less abundant than the preceding and found in rather deeper water. Otherwise very similar in size and habits.

179. *Sebastichthys nebulosus* (Ayres) Gill.—*Garrupa*; *Rock Cod*.

From Monterey to Puget Sound; rather common, and becoming abundant northward. It occurs in water of moderate depth and is taken by means of hooks and gill-nets. It is rather common in the markets of San Francisco, and reaches a weight of 3½ pounds.

180. Sebastichthys serriceps J. & G.—*Tree-fish*.

From San Diego to San Francisco; abundant about Catalina Island in rather deep water among rocks; less common northward, but occasionally seen in the San Francisco markets. It reaches a weight of about 3 pounds.

181. Sebastichthys nigrocinctus (Ayres) Gill.

Monterey to Puget Sound; rather abundant in the Straits of Fuea in very deep water; rare about San Francisco, and only occasionally taken with a hook and line in deep water. It is one of the most striking species in color, and hence preferred by buyers. It reaches a weight of 4 pounds.

182. Scorpaena guttata Grd.—*Scorpen*; *Sculpin*; *Scorpion*.

Santa Barbara southward; very abundant in rocky places, and often in bays and shallow water. It feeds on crustacea and spawns in spring. It is esteemed as one of the best of food-fishes. It reaches a weight of rarely more than 1½ to 2 pounds. A wound from its dorsal spines is extremely painful for a time, like a poisoned sting.

Family COTTIDÆ.

183. Nautichthys oculoasciatus Grd.

From San Francisco northward, rare; occasionally taken in Puget Sound in rather deep water. It reaches a length of 6 to 8 inches.

184. Blepsias cirrhosus (Pallas) Gthr.

From San Francisco northward, scarce; not rare in Puget Sound, where it is sometimes taken in seines. It reaches a length of about 6 inches. Like the preceding, it is occasionally preserved as a curiosity.

185. Oligocottus analis Grd.—*Little Scorpion*.

From Monterey to Lower California; common in rock-pools, and extremely active. It reaches a length of about 4 or 5 inches.

186. Oligocottus maculosus Grd.—*Johnny*.

From San Luis Obispo to Alaska; exceedingly abundant northward, in rock-pools and among stones close to shore in sheltered bays. One of the most abundant species on the coast so far as the number of individuals is concerned. It reaches a length of 2½ inches, being the smallest of our marine *Cottidæ*. It is subject to great variations in color, dependent on the character of its surroundings.

187. Blennicottus globiceps (Grd.) Gill.

From Monterey to Puget Sound and northward, in rock-pools, with the preceding. Its motions are, however, much less active. It is nowhere abundant. It reaches a length of 5 inches.

188. *Liocottus hirundo* Girard.

About Santa Barbara and the islands; taken with hook and line; rare. It reaches a length of about 7 inches.

189. *Leptocottus armatus* Grd.—*Sculpin*; *Drummer*.

Entire coast; everywhere abundant in lagoons, sheltered bays, and muddy bottoms. It feeds on crustaceans, and takes the hook readily. It reaches a length of a foot, and is held in no esteem. Some are dried by the Chinese, who consider it one of the least valuable fishes. Its movements are in general more active than those of most sculpins.

190. *Scorpenichthys marmoratus* Grd.—*Sculpin*; *Capisone*; *Salpa*; *Biggyhead*.

Entire coast; very abundant about San Francisco, becoming less common north and south, but seen by us at Victoria and San Diego. It lives in the kelp, at moderate depths, and is taken with the hook or gill-net. It is a coarse, dry fish, held in very low esteem, and not sent to the market from any great distance. It reaches a length of about 2 feet and a weight of 8 to 10 pounds, being much the largest of the Cottoids on this coast.

191. *Aspicottus bison* Grd.—*Stone Sculpin*; *Salpa*.

San Francisco northward; exceedingly abundant in Puget Sound in rocky places, and among weeds at small depths in sheltered bays. At Seattle the most abundant of the family. Less common at San Francisco. It feeds chiefly on *Ulva* and other green plants, of which its long intestines are always full. It takes the hook readily with any sort of bait, and therefore probably does not disdain animal food. It reaches a length of about a foot, and is seldom used for food. The European *Cottus bubalis* Euphrasen, with which this species is considered identical by Dr. Günther, is a true *Cottus*, and has no intimate relation to *Aspicottus bison*.

192. *Hemilepidotus trachurus* (Pallas) Gthr.

From San Francisco northward, in similar situations with the preceding, but much less abundant. It feeds chiefly on crustacea. It reaches a length of about 15 inches, being, next to *Scorpenichthys*, the largest Cottoid of our west coast. It is rarely used as food.

193. *Hemilepidotus spinosus* Ayres.—*Capisone*; *Cabezon*.

About San Francisco and Monterey, where it is rather common. Taken chiefly by the Chinese on set-lines in rather deep water. It reaches a length of 9 inches, feeds on crustacea, and is held in no esteem as food.

194. *Artedius pugetensis* Steind.

Puget Sound; not abundant. It feeds on crustacea, etc. It reaches a length of about 9 inches, and is seldom used as food.

195. *Artedius megacephalus* Lockington.—*Chitonotus megacephalus* Lockington. Mining and Scientific Press, San Francisco, 1879.)

Deep water off San Francisco. Distinguished from the preceding by the greatly-elevated anterior portion of the spinous dorsal, the first spine reaching past the front of the soft dorsal. Specimens numbered 27, 185, from Point Reyes, lately distributed by the National Museum as *Artedius pugetensis*, belong to this species.

196. *Artedius quadriseriatus* Lockington.

Only seen about San Francisco, where it is very common in deep water off Point Reyes, being brought in by the sweep-nets, mixed with tom-cod and prawns. It reaches a length of less than 3 inches.

197. *Artedius notospilotus* Grd.—*Sculpin*; *Drummer*; *Salpa*.

Santa Barbara to Puget Sound, most abundant at Santa Barbara. It lives in the kelp, in water of moderate depth, and is mostly taken with the hook. It reaches a length of 4 to 5 inches, and is little esteemed.

198. *Artedius lateralis* Grd.

Monterey to Puget Sound, inhabiting the rock-pools with the species of *Oligocottus*; not common anywhere. It reaches a length of about 4 inches. It is readily distinguished from the preceding by the larger mouth and the naked, smooth head.

199. *Cottus polyacanthocephalus* Pallas.—*Sculpin*; *Bull-head*.

Puget Sound and northward; generally abundant; not seen southward. Carnivorous. It reaches a length of 15 inches or more, and although of considerable size is not often used as food. There is much waste in a sculpin, the removal of the head and skin leaving very little meat, and that little comparatively is coarse and dry.

200. *Ascelichthys rhodorus* J. & G.

At Waada Island and other points at the entrance of the Straits of Fuca; exceedingly abundant among the rocks at low tide. Specimens in Mr. Lockington's collection from Gualala, Mendocino County, California. Carnivorous, reaching a length of 3½ inches.

201. *Psychrolutes paradoxus* Gthr.

Puget Sound and northward; a specimen from the Aleutian Islands is in the Museum of the Alaska Commercial Company. It reaches a length of 2 inches.

Family AGONIDÆ.

202. *Bothragonus swani* (Steind.) Gill.

Not seen by us; the original specimen from Port Townsend.

203. *Podothecus trispinosus* (Lockington) J. & G.

San Francisco to Santa Barbara; occasionally brought in among prawns to the markets of San Francisco; one specimen dredged at Santa Barbara. It reaches a length of 3 inches.

204. *Podothecus vulsus* J. & G.

About San Francisco in the open sea. Brought into market occasionally with prawns, and sometimes taken in sweep-nets by the paranzelle, which are large fishing-boats, sailing in pairs before the wind, drawing a large net behind and between them on the bottom. It reaches a length of $4\frac{1}{2}$ inches.

205. *Podothecus acipenserinus* (Pallas) Gthr.

Puget Sound and northward; abundant; taken frequently in seines in water of moderate depth. It reaches a length of about a foot.

206. *Brachyopsis xyosternus* J. & G.

Bay of Monterey; abundant in June along the shore about Soquel; not seen elsewhere; taken in seines. It reaches a length of 5 or 6 inches.

207. *Brachyopsis verrucosus* Lockington.

Point Reyes to San Francisco; occasionally brought into the markets with tom-cod or prawns, many being taken in the sweep-nets. It reaches a length of 6 to 8 inches.

208. *Aspidophoroides inermis* Günther.

Described from the Gulf of Georgia; not seen by us.

Family TRIGLIDÆ.

209. *Prionotus stephanophrys* Lock.

One specimen known, from off Point Reyes.

Family LIPARIDIDÆ.

210. *Liparis pulchellus* Ayres.

About San Francisco and Monterey, and probably northward, but not seen by us elsewhere. Taken occasionally with seines at Soquel, and sometimes brought into the San Francisco market. It reaches a length of 5 or 6 inches.

211. *Liparis, cyclopus* Günther.

A single young specimen obtained by us at Monterey.

212. *Liparis mucosus* Ayres.

About San Francisco, and probably northward. It reaches a length of 5 or 6 inches.

Family CYCLOPTERIDÆ.

213. *Eumicrotremus orbis* (Gthr.) Gill.

Described from Esquimault Harbor; not seen by us on the coast. A specimen is in the Museum of the Alaska Commercial Company from the Aleutian Islands.

Family GOBIESOCIDÆ.

214. *Gobiesox reticulatus* (Grd.) J. & G.—*Sucking-fish*.

From Monterey northward to Puget Sound; not noticed southward; very abundant at Point Pinos, and about Cape Flattery, where it lives among the rocks between tide-marks. Its motions in the water are active, but it is usually found clinging to stones. It feeds on small shells and crustacea, and reaches a length of 5 to 6 inches.

215. *Gobiesox rhessodon* Rosa Smith Mss.

Under rocks at Point Loma, near San Diego; locally rather abundant.

Family BLENNIIDÆ.

216. *Hypleurochilus gentilis* (Grd.) Gill.

From Santa Barbara southward; not rare in rock-pools between tide-marks, among algæ. It reaches a length of 5 inches.

217. *Neoclinus blanchardi* Grd.

From Monterey southward, in the kelp; taken occasionally with hook and line. Feeds chiefly on crustacea. It reaches a length of 7 to 8 inches. Seen by us at Monterey, San Luis Obispo, and Santa Barbara.

218. *Neoclinus satiricus* Girard.

Monterey southward; rare. Seen by us at Monterey, only. It reaches a length of a foot, and lives in the kelp.

219. *Heterostichus rostratus* Grd.—*Kelp-fish*.

From Monterey southward; not rare in the kelp south of Point Concepcion. Taken with hook and occasionally with seines. It feeds on crustacea, etc. It reaches a length of about 15 inches. It is sometimes brought to market with other fish, but no special notice is taken of it.

220. *Gibbonsia elegans* Cooper.

From Monterey southward; abundant everywhere in kelp and rock-pools. It reaches a length of 8 inches, and is not noticed by the fishermen.

221. *Cremnobates integripinnis* Rosa Smith.

San Diego to Mazatlan; the specimens from our coast found in rock-pools near La Jolla, 12 miles north of San Diego, among algæ between tide-marks. Length $2\frac{1}{2}$ inches.

222. *Murænoides ornatus* (Grd.) Gill.—*Eel*.

San Francisco northward; abundant in Puget Sound. Found in rock-pools in sheltered places and sometimes taken in seines. It reaches a length of a foot. It is not considered a food-fish. The form called *M. letus* is considerably more abundant than the typical *ornatus*. They two differ only in the form of the dorsal blotches and are, probably, not distinct species.

223. *Apodichthys fucorum* J. & G.

Monterey to Puget Sound; very abundant at Point Pinos; less common about Cape Flattery. It is very abundant in the *Fucus* between tide-marks, especially where thick bunches of the slender *Fucus* hang from rocks into a little pool of water. At Monterey large numbers may often be shaken from a tuft of *Fucus*, at considerable distance from the water. Its movements are exceedingly active, more so than those of other eel-shaped blennies. It reaches a length of 5 or 6 inches.

224. *Apodichthys flavidus* Grd.

San Luis Obispo to Puget Sound, in rock-pools and in the kelp. Frequently taken with seines. It reaches a length of over a foot, and is remarkable for its brilliant colors, which vary from bright green to orange and violet with its surroundings. It feeds, like the three preceding species, on crustacea and small shells.

225. *Anoplarchus alectrolophus* (Pallas) J. & G.

From Monterey northward; most abundant in Puget Sound. It inhabits the region between tide-marks, where it is sheltered from the surf. It is usually found among weeds and stones where the bottom is very muddy. It reaches a length of about 8 inches. Pyloric cæca are present in this species, as in the species of *Xiphister* and *Cebedichthys*. They are wanting in *Apodichthys* and *Muraenoides*.

226. *Xiphister chirus* J. & G.

From Monterey northward; more abundant about Puget Sound. It inhabits the region about low-tide mark, among rocks or mussel shells which are exposed to the action of the waves. Like the others of the genus it is strictly herbivorous, feeding on red or green algæ. It reaches a length of 6 to 8 inches.

227. *Xiphister mucosus* (Grd.) Jor.

From Monterey northward; everywhere very abundant among loose rocks between tide-marks. It feeds on algæ, and reaches a length of about 20 inches. Occasionally brought into the San Francisco market, where it sells at 30 cents per pound.

228. *Xiphister rupestris* J. & G.

From Monterey northward; everywhere very abundant with the preceding. It reaches a length of about a foot.

229. *Lumpenus anguillaris* (Pallas) Gill.—*Eel*.

From Northern California northward; exceedingly abundant in Puget Sound, where it inhabits sandy shores in water of moderate depth. It feeds chiefly on algæ. It reaches a length of 20 inches. It is occasionally brought into the markets, but is not valued as food, and apparently seldom eaten, its looks being against it.

230. *Anarrhichthys ocellatus* Ayres.—*Eel; Morina; Asia; Wolf Eel.*

From Monterey northward; not rare, but not very abundant. It feeds on crustacea and fishes. It reaches a length of 8 feet and a weight of at least 25 pounds. It is sent to the markets and brings a fair price.

Family BATRACHIIDÆ.

231. *Porichthys porosissimus* (C. & V.) Grd.—*Mud-fish; Cat-fish; Drummer; Singing fish.*

Exceedingly abundant the entire length of the coast in shallow, muddy, or weedy bays, often under stones. It reaches a length of somewhat more than a foot, and is never used as food.

Family ZOARCIDÆ.

232. *Lycodopsis paucidens* (Lockington) Gill.

San Francisco and northward; not very common; brought in with the tom-cod taken in sweep-nets off Point Reyes. It reaches a length of about 10 inches. No notice is taken of it as a food-fish.

233. *Lycodopsis pacificus* Collett.

San Francisco northward, with the preceding; abundant in Puget Sound. Distinguished only by the smaller head and mouth.

Family CONGROGADIDÆ.

234. *Scytalina cerdale* J. & G.

In loose stones near low-tide mark, on Waada Island, near Cape Flattery. It reaches a length of about 6 inches. It is exceedingly active in life.

Family OPHIDIIDÆ.

235. *Ophidium taylori* Grd.

San Francisco to Santa Barbara; not very common; taken in sweep-nets with tom-cod, etc., about San Francisco, and sometimes brought into the markets. It reaches a length of about 14 inches, and no special notice is taken of it.

Family BROTULIDÆ.

236. *Brosomphycis marginatus* (Ayres) Gill.—*Cusk; Mustela.*

San Francisco and northward; rare; occasionally brought into the San Francisco market, and from its bright colors readily salable. It reaches a length of nearly 18 inches.

Family GADIDÆ.

237. *Microgadus proximus* (Grd.) Gill.—*Tom Cod; Whiting.*

Monterey to Puget Sound; very abundant from San Francisco northward, and taken in immense numbers in seines and sweep-nets. Its flesh is somewhat watery and tasteless, yet it meets with a ready sale. It reaches a length of about a foot and a weight of about $\frac{1}{2}$ pound.

233. *Gadus morrhua* L.—*Alaska Cod*.

Straits of Fuca and northward; abundant on certain banks; probably occurring off the coast of Oregon.

239. *Pollachius chalcogrammus* (Pallas) J. & G.

(*Gadus periscopus* Cope.)

Monterey and northward; occasionally taken with hook in deep water about Seattle with *Bathymaster signatus*; very rare about San Francisco. It reaches a length of about 2 feet.

240. *Merlucius productus* (Ayres) Gill.—*Merluccio*; *Horse Mackerel*.

Santa Cruz Island northward; very abundant at certain seasons, especially at its spawning time in the spring, when it is taken in great numbers in the gill-nets at Monterey, Soquel, and elsewhere. Its distribution is irregular, being very abundant some years but at other times extremely scarce. It is extremely voracious, feeding on all sorts of small fishes and squids, its stomach being always full. It ranks low as a market fish, as its flesh is extremely soft, and it is always ragged-looking when shipped. It reaches a length of rather more than 2 feet and a weight of 10 pounds.

Family PLEURONECTIDÆ.

241. *Atheresthes stomias* J. & G.

San Francisco and northward; the only specimens taken by us were from between Point Reyes and the Farallones. It reaches a length of 30 inches and a weight of 5 or 6 pounds, being probably the slenderest flounder known.

242. *Hippoglossus vulgaris* Fleming.—*Halibut*.

From San Francisco northward; not abundant south of the Straits of Fuca. There is a large halibut bank near Cape Flattery, and considerable numbers are taken in the deeper channels of the sound by means of hook and line. It reaches a length of 5 or 6 feet and a weight of 200 pounds or more. It feeds on codfish and any other large fish which it can take. Its flesh is much esteemed.

243. *Xystreureys liolepis* J. & G.

Santa Barbara and southward; not very rare, in moderately deep water and about the kelp. It reaches a length of about 14 inches and a weight of a little over 2 pounds.

244. *Paralichthys maculosus* Grd.—*Monterey Halibut*; *Bastard Halibut*; *Flounder*.

(*Uropsetta californica* Gill.)

Tomales Bay southward; abundant from Monterey to San Diego, being the most abundant flounder south of Point Concepcion, the young swarming in all the bays, the adult comparatively rare. It reaches a length of nearly 3 feet and a weight of 60 pounds, the largest seen by

us weighing 55 pounds. The large ones are taken chiefly in gill-nets. As a food-fish it is considered rather inferior to the others, the large ones being tough and coarse.

245. *Hippoglossoides jordani* Lockington.—*Sole*; *Soglia*.

Monterey to Puget Sound; rare northward, but very abundant about San Francisco. At Monterey it is the most abundant species. It is considered one of the best of its family. Great numbers are salted, hung up by the tails, suspended above the roofs, and dried, by the Chinese. It reaches a length of 18 inches and a weight of 3 to 5 pounds.

246. *Hippoglossoides elassodon* J. & G.

Puget Sound and northward; not uncommon about the wharves of Seattle and Tacoma, where it is taken with hook and line. It reaches the length of about a foot and a weight of at least 2 pounds.

247. *Hippoglossoides exilis* J. & G.

San Francisco to Puget Sound, in deep water. Taken about Point Reyes with sweep-nets, at certain times, in enormous numbers. Less common about Seattle. A small species; none seen over 9 inches in length, weighing about $\frac{3}{4}$ pound. It is not valued, the flesh being soft. Most of those taken by the paranzelle are thrown away.

248. *Psettichthys melanostictus* Grd.—*Sole*.

From Monterey to Puget Sound; everywhere common, but not so abundant as some other species. It is considered the best of the flounders for the table. It reaches a length of nearly 20 inches and a weight of 4 to 5 pounds.

249. *Citharichthys sordidus* (Grd.) Gthr.—*Plaice*.

Entire coast; most abundant northward; rather rare south of Point Concepcion. It frequents rather deep water, and is best taken with hook or sweep net. It is one of the smaller species, rarely weighing more than $1\frac{1}{2}$ pounds, and its flesh is comparatively soft. Many are dried by the Chinese, who do not find it necessary to hang them up as in the case of the larger "sole", but dry them upon tables.

250. *Parophrys isolepis* (Lockington) J. & G.—*Sole*.

From Monterey to Puget Sound, in rather deep water; not rare; large numbers are brought into the San Francisco market, being taken in the sweep-nets about Point Reyes. It reaches a length of 15 inches and a weight of 3 pounds, although usually much smaller.

251. *Parophrys ischyryus* J. & G.

Puget Sound; not common; the four specimens seen taken near Seattle with a seine. It reaches a length of 18 inches and a weight of about 4 pounds.

252. *Parophrys vetulus* Grd.—*Sole*.

Santa Barbara to Alaska; very abundant from Monterey northward to Puget Sound. It is usually one of the smallest species, reaching a length of about 14 inches and a weight of 2 or 3 pounds. Most of those seen in the markets weigh about half a pound. It is one of the principal market species, and usually sells well.

253. *Lepidopsetta bilineata* (Ayres) Lock.—*Rock Sole*.

Monterey to Alaska; rather common about rocky places, and abundant in Puget Sound; considerable numbers are taken with set-lines by the Chinese at Monterey. It reaches a length of 18 inches and a weight of 3 to 5 pounds.

254. *Pleuronectes stellatus* Pallas.—*Flounder*.

From San Luis Obispo northward; everywhere very abundant, especially northward and about the mouths of rivers; the commonest flounder on the coast. It is reckoned a good food-fish when not too large. It reaches a length of 2 feet and a weight of at least 10 pounds.

255. *Glyptocephalus zachirus* Lockington.—*Sole*.

About San Francisco and Monterey, in rather deep water; taken chiefly with the sweep-nets, its mouth being too small for the hook and its habitat too deep for the gill-nets. It reaches a length of 18 inches and a weight of about 2 pounds, and is considered excellent food.

256. *Cynicoglossus pacificus* (Lock.) J & G —*Sole*.

Monterey to Puget Sound, in rather deep water; generally abundant; taken chiefly in the sweep-nets. Rather common at Seattle, and often brought in immense numbers from the sweep-nets to the San Francisco markets. It spawns in May and June. It reaches a length of a little more than a foot and a weight of 2 pounds. This species is excessively slimy when taken out of the water. It is considered as a good food-fish when large. The small ones, taken so abundantly, are little valued.

257. *Hypsopsetta guttulata* (Grd.) Gill.—*Turbot*; *Diamond Flounder*.

Tomales to San Diego; widely distributed, but not so abundant anywhere as most of the other species. Considerable numbers are brought to the San Francisco market, but none have been noticed by us in Monterey Bay. It reaches a length of nearly a foot and a weight of about 3 pounds.

258. *Pleuronichthys cœnosus* Grd.

San Diego to Alaska, in deep water; not very abundant anywhere south of Puget Sound, where it is quite common. It is chiefly herbivorous, like the other species of the genus, and with them spawns in May to July. It reaches a length of about a foot and a weight of 2 to 3 pounds. It is rarely seen in the San Francisco markets.

259. *Pleuronichthys decurrens* J. & G.

Monterey and San Francisco (and northward?), in deep water. Large numbers taken in sweep-nets about the Farallones and brought into the San Francisco markets. In size, food, and habits similar to the preceding, but more abundant.

260. *Pleuronichthys verticalis* J. & G.

Monterey and San Francisco, in deep water; taken at Monterey in considerable numbers in the spawning season by means of gill-nets. It is similar in size, feed, and habits to the others, but most specimens seen in the markets are of smaller size.

261. *Aphoristia atricauda* J. & G.

Numerous specimens, 3 to 5 inches long, taken at San Diego.

Family AULORHYNCHIDÆ.

262. *Aulorhynchus flavidus* Gill.

Monterey to Puget Sound, in large schools in sheltered bays near the shore; not common southward. It reaches a length of 5 to 6 inches.

263. *Gasterosteus microcephalus* Grd.—*Stickleback*.

(*Gasterosteus plebeius* and *pugetti* Grd.)

In rivers and brackish waters from Los Angeles River to Puget Sound; commonest southward. Length 2 inches.

264. *Gasterosteus aculeatus* var. *cataphractus* (Pallas) J. & G.—*Stickleback*; *Salmon Killer*. (*Gasterosteus serratus* Ayres; *Gasterosteus inculptus* Rich.)

In salt water, entering rivers from San Francisco to Alaska; very common northward. Length 2½ inches.

Family SYNGNATHIDÆ.

265. *Siphostoma californiense* (Storer) J. & G.—*Pipe-fish*.

Santa Barbara to Puget Sound; the form called *S. griseolineatus* from San Francisco northward, the other southward and generally common; most common at Soquel. It reaches a length of 15 to 18 inches.

266. *Siphostoma leptorhynchus* (Grd.) J. & G.

Santa Barbara to San Diego; not very common except in San Diego Bay. It reaches a length of less than a foot.

267. *Siphostoma punctipinne* (Gill) J. & G.

Only the original types, from San Diego, are yet known.

Family HIPPOCAMPIDÆ.

268. *Hippocampus ingens* Grd.—*Sea Horse*.

San Diego; rare. Reaches a length of about a foot.

Family TETRODONTIDÆ.

269. *Cirrhisomus politus* (Ayres) J. & G.

Not obtained by us. A specimen in collection of California Academy, from San Diego.

Family DIODONTIDÆ.

270. *Diodon maculatus* Lac.

One specimen, from near San Diego.

Family ORTHAGORISCIDÆ.

271. *Mola rotunda* Cuvier.—*Sunfish*; *Mola*.

Abundant in Santa Barbara Channel in summer; often seen playing near the surface, and even leaping from the water; not often taken, as they are not easily caught and not used for food. Reaches a weight of 200 pounds or more.

UNITED STATES NATIONAL MUSEUM,
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DESCRIPTION OF SEBASTICHTHYS MYSTINUS.

By DAVID S. JORDAN and CHARLES H. GILBERT.

Sebastichthys mystinus.

Sebastes variabilis Ayres, Proc. Cal. Acad. Nat. Sci. i, 7, 1854 (not of Pallas, = *Epinephelus ciliatus* Tilesius).

Sebastes melanops Ayres, Proc. Cal. Acad. Nat. Sci. ii, 216 (in part; probably not the figure 66, which more resembles *S. melanops*; not *Sebastes melanops* Girard, = *Sebastosomus simulans* Gill).

Sebastichthys melanops Jordan & Gilbert, Proc. U. S. Nat. Mus. iii, 1880, 289, and elsewhere.

Sebastichthys mystinus Jordan & Gilbert, Proc. U. S. Nat. Mus. iii, 1880, 445; 1881, 8.

Two species have been confounded by previous writers under the name of *Sebastes* or *Sebastosomus melanops*. The one, darker in color, with smaller mouth and black peritoneum, is found from Puget Sound to San Diego, being most common southward, and is perhaps the most abundant species of the genus on the coast. The other, paler and more spotted, with larger mouth and white peritoneum, ranges from Monterey to Sitka, being most common northward. The first is the "Pêche Prêtre" of the Monterey fishermen, the second the "Black Bass" of the anglers of Puget Sound. The first is referred to by us as *Sebastichthys melanops* on page 289 and elsewhere in these Proceedings (Vol. III); the second as *Sebastichthys simulans*. The original description by Girard of his *Sebastes melanops*, however, can refer only to the second fish, as is shown by the following statements (U. S. Pac. R. R. Expl. Fishes, 81):